THE Chemist

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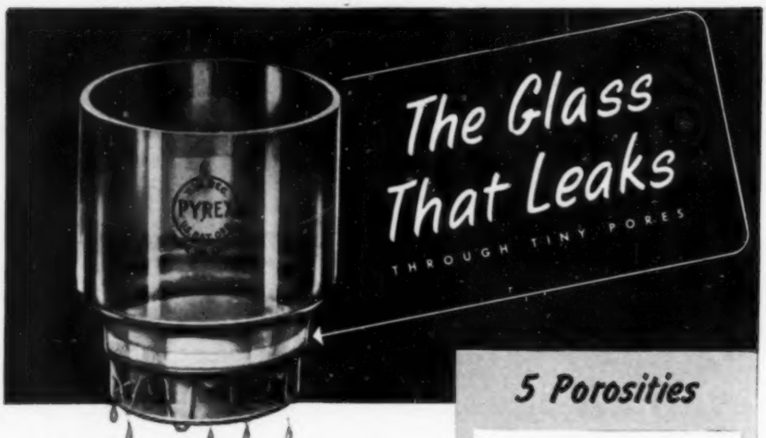
IN THIS ISSUE



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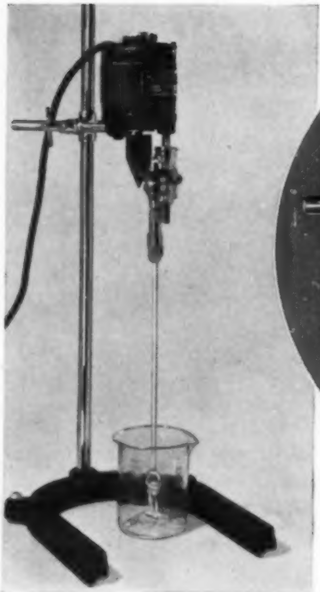

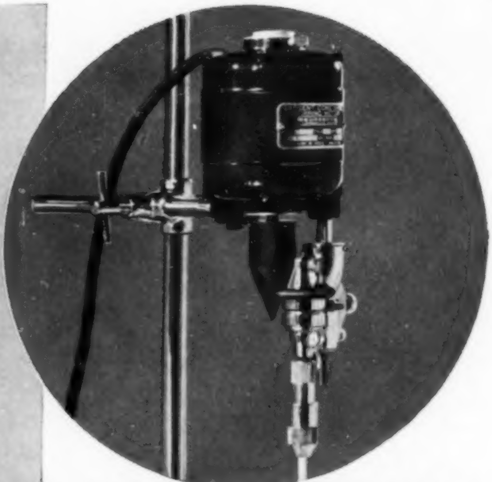

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The Petroleum Chemist

Gustav Egloff, F.A.I.C.

Director of Research, Universal Oil Products Company

THE influence of the chemist in petroleum research and development work has been felt since 1855, when Professor Silliman of Yale University reported on the properties and commercial possibilities of Pennsylvania "rock oil". The analysis was reported four years before the famous Drake oil well came in.

Since this early period, chemists and chemical engineers have played mighty roles in making the oil industry what it is today. They have contributed to the discovery of oil, its production, treatment in the oil fields, transportation, refining and marketing of products.

In the search for oil the chemist has played a leading part. He has analyzed surface and sub-surface waters, sulfur beds and salt domes associated with petroleum, and correlated the data with the geology of oil formations.

He has studied gaseous emanations occurring in the neighborhood of oil deposits and developed methods for determining the presence of minute traces of hydrocarbons in the soil. These analyses have indicated that the presence of oil accumulations may be detected by telltale hydrocarbon halos at ground levels.

The chemist has fixed geological relationships in underground strata by identifying characteristic mineral types and has determined permeabilities of sub-surface rock samples to enable prediction of oil flow rates.

The chemist's contributions to oil well drilling and higher ultimate production are of the first order. Special alloys have been developed possessing a hardness which gives drill bits greater resistance to the terrific wear encountered in perforating rocks to reach oil-bearing levels. Bits made of or faced with stellite, an alloy of cobalt, tungsten and chromium or with tungsten carbide, markedly advanced the speed of drilling.

Colloidal chemistry has advanced the art of drilling by producing stable colloids so important in controlling sub-surface conditions. Drilling fluids called "muds" are

carefully controlled aqueous suspensions of clays, weighted with barytes, hematite, etc. Their viscosities and densities are varied as a function of well depth so as to counterbalance sub-surface pressures from gases, oil and water layers.

Drilling fluids lubricate and cool the drill and carry rock cuttings to the surface. They seal off water, minor oil and gas sands, and soluble materials, and prevent heaving and caving of walls.

For sealing well casings and preventing water infiltration, special cements having specific times of initial and final sets are used. For wells up to 2,000 feet in depth, Portland cements are usually satisfactory, while deep wells with temperatures as high as 300°F. require cements having very special properties.

The chemist first provided nitroglycerin for disintegrating underground formations to permit a freer flow of petroleum. He later initiated the acidizing procedure for increasing the permeability of pay zones by the action of hydrochloric acid upon oil-bearing limestones and dolomites.

To prevent damage to steel casings, special inhibitors were added to the acid, and by combining the acidizing procedure with rotary drilling a twenty-five per cent saving in costs is effected. Hydrofluoric acid is being used to react with silica in the oil strata in order to increase oil production. Acidizing of oil wells has gone into wide commercial use adding greatly to our oil supplies.

In recent technical advances, detergents to lower the surface tension of water are being injected into formations containing both oil and water to increase the flow of oil and retard the flow of water so that proportionally more oil is produced.

Once the oil has been brought to the surface, chemical demulsifiers and electrical precipitation are applied to break persistent emulsions and obviate subsequent corrosion problems by eliminating the last traces of brines.

Storage tanks and reservoirs are lined with corrosion-resistant cements or surfaced on the inside by special paints containing synthetic resins or rubbers.

In the transportation of oils to refining centers, the chemist has reduced pipeline corrosion both inside and out. The effects of dissolved oxygen on inside corrosion have been markedly reduced by the injection of sodium sulfite solutions or the addition of inhibitors such as mercaptobenzothiazole. A special pickling process for removing scale and smoothing the interior of pipelines has recently been reported to increase their capacity by fifteen per cent.

To protect the outside of pipe-

lines against corrosion in acid soils, many methods have been employed. The pipes may be wrapped in the factory or in the field with bitumen saturated fabrics or with aluminum foil. Special paints containing phenolic resins, rubber derivatives, or tung oils are also used as protective coatings. Cathodic protection of hundreds of miles of pipelines prevents corrosion in certain soils.

During the early part of this century, the increasing number of motor cars gave the impression that there would be an impending shortage of gasoline to operate them. This brought a great amount of research to devise means of increasing the yield of motor fuel derived from each barrel of crude oil, with the result that chemists developed commercial cracking processes.

The greatest factor in the conservation of petroleum resources was cracking, which not only increased the yield of gasoline to twice that obtainable by simple distillation of crude oils, but provided a product of improved combustion characteristics so that engines of higher compression ratios could be used and greater efficiencies obtained.

It has been estimated by the American Petroleum Institute that in the period from 1920 to 1940, 13,584,909,000 barrels of crude oil were conserved. The percentage of gasoline from crude is still increasing because of processes being developed by chemists and chemical engineers for the more efficient utilization of all portions of petroleum.

By painstaking analytical work on the composition of cracked and straight-run gasolines and by the synthesis of pure hydrocarbons, chemists laid the foundation for present day automotive fuel developments which involve more and more the use of blends of individual hydrocarbons rather than gasolines of varying composition with uncertain combustion characteristics.

Working along this line in close collaboration with engine designers, the chemist developed relationships between hydrocarbon structure and octane ratings. The refining industry now knows the type of hydrocarbons to produce in order to obtain higher engine efficiencies. Thus, processes for the manufacture of high-octane rating hydrocarbons, neohexane, dixane, triptane, isooctanes, toluene, xylenes and cumene, have been developed.

For years motor fuels were heavily treated with chemicals to produce stable water white products. This refining caused not alone loss of antiknock properties, but gasoline as well by polymerization. The chemist then developed antioxidants which stabilized the properties of gasoline and as a consequence has conserved huge volumes yearly.

The low-boiling mercaptans present in gasoline have to be removed due to their odor, hence processes for selectively removing them are in commercial operation. The mercaptans thus removed from gasolines are now utilized along with hydrogen sulfide to produce sulfuric acid, and thus an erstwhile liability has been converted into a positive asset.

The chemist and the chemical engineer improved the thermal cracking process by using catalysts which modified the reactions to increase the yield and quality of the gasoline. The by-product hydrocarbon gases are catalyzed to produce alkylates of over ninety-two octane rating.

The synthetic silica-alumina cracking catalyst produces higher octane base stocks and hydrocarbon gases of higher percentages of butylenes and butanes. These are processed by polymerization, alkylation, and isomerization reactions to produce more branched chain products of high octane ratings. Normal butylenes from catalytic cracking are used in part for the production of butadiene and also isobutylene for synthetic rubber.

Solid phosphoric acid catalyst polymerizes propylene and butylenes in cracked gases to polymer gasoline and iso-octenes for hydrogenation to iso-octanes. Chromium and aluminum oxide catalysts are used to dehydrogenate normal butane to butylenes for aviation gasoline and butadiene for synthetic rubber. Similar catalysts dehydrogenate ethylbenzene to styrene, the other essential component of Buna-S rubber. Ethylbenzene is being produced from the alkylation of benzene with ethylene and ethyl alcohol. Cumene, a component of 100-octane gasoline, is produced from benzene and propylene in a similar manner to ethylbenzene.

In the alkylation of iso-butane with olefins, sulfuric acid or hydrogen fluoride catalysts are employed, and iso-octane and other branched chain paraffins are produced to add octane rating to aviation fuels. Aluminum chloride catalysts are used to isomerize butane, pentane and hexanes to increase the supply of iso-paraffins.

Research has produced many compounds which are added in small amounts to gasolines, Diesel fuels and lubricating oils to improve their effectiveness and stabilize their properties. Outstanding in this group of chemicals are the phenolic and aminophenolic inhibitors to prevent cracked gasolines from deteriorating during storage. A remarkable compound which is so highly important in improving antiknock properties of gasoline is tetraethyl lead. Combustion accelerators, such as benzoyl peroxide and nitroparaffins, are used in the combustion of Diesel fuels.

In the lubricating oil field, fatty acids are added to increase their adhesiveness to bearings. Chlorine and sulfur-containing compounds improve the effectiveness of extreme pressure lubricants. Pour-point depressors keep paraffin from crystallizing, and raise the viscosity index. Detergents are added to maintain clean bearing surfaces.

In the refining field the manufacture of special chemical derivatives is now the order of the day. Methyl, ethyl, isopropyl and butyl chlorides, ethylene dichloride and trichlorol-ethylene, are manufactured. Ethylene from cracked gases provides ethyl alcohol and glycol, while propylene yields isopropyl alcohol and glycerol, hence nitroglycerin.

The chemist discovered solvents which are of the greatest importance: Liquid sulfur dioxide, phenols, furfural or chlorex to separate aromatics from gasoline, kerosene and lubricating oils.

The chemical engineer has also come into his own in pilot plant experimentation and the design and commercial installation of refining processes. This type of engineering requires both research insight and practical knowledge of materials and ability to handle them. The planning of the full scale unit involves many research problems. Fractionation is only one example. We have witnessed in our generation a transition from rock-packed dephlegmators to bubble columns and to superfractionators to separate pure hydrocarbons from mixtures.

The influence of the chemical engineer in overcoming great difficulties is shown by the control of radiant energy in furnaces. In the early stages of furnace development the oil industry was frightened by the idea of using radiant heat from flames or furnace walls and only utilized convection heat. Radiant energy has been harnessed. At the present time, cracking units operaate with radiant energy for six months or more with no material coke deposition in the heating tubes, whereas formerly a shutdown of the plant resulted after a few hours of operation.

One further comment should be made about the place of the chemist and chemical engineer, in the petroleum industry. Formerly the highly trained technical man was allowed to dominate the laboratory and even conduct small scale experiments in metal apparatus, but was looked upon with suspicion when he turned his hand to such practical matters as plant operation and the problems of mangement. This situation has changed.

The advent of new processes requiring the strictest sort of technical control for their success has brought the chemist and chemical engineer to the fore in executive positions.

Today it is difficult for a so-called "practical" man without technical training to direct the highly involved scientific and technical operations of the oil industry. Only the trained mind can grasp the problems presented by the many advances in petroleum technology.

The future of the oil industry will more than ever be in the hands of the scientist, the technologist, the industrialist, among whom the chemist and chemical engineer will have an important role in finding and producing petroleum, transporting and refining it into useful products, for the war effort and the peace period to come.

Shell Co. Develops New Refractometer

The technical staff of the Shell Development Company, Emeryville, California, has developed a refractometer to test butadiene under conditions of continuous production, where it is impractical to collect samples for removal to the testing laboratory. With this new instrument, readings are taken at the pressure at which butadiene is produced.

Precision Scientific Company, Chicago, is now manufacturing the Shell continuous flow pressure-type refractometer.

What's Wrong With Kilgore Bill

Walter S. Landis, F.A.I.C., vice president of American Cyanamid Company, has factually analyzed the provisions of the Kilgore Bill (S.702) in order that all its ramifications may be fully understood. This analysis has been published in booklet form, containing 41 pages (6"x9").

The New York Branch of The American Pharmaceutical Association presented its 1943 Remington Honor Medal to Robert P. Fischelis at a dinner on December seventh. The award was made in recognition of his years of activity in public health and welfare. He is secretary of the Board of Pharmacy of the State of New Jersey and president of the New Jersey Pharmaceutical Association.

I. F. Laucks, Inc., has been awarded a star to add to its Army and Navy E pennant at its Seattle plant.

The Chemist in Postwar Nutrition

C. G. King, F.A.I.C.

Scientific Director, The Nutrition Foundation

THERE are several reasons for considering the chemist's role in post-war nutrition. In the first place, the chemist, like everyone else, is interested in public health, and one can scarcely question any longer whether there is a close relation between our food intake and our health.

Let me cite two examples by way of illustration. Dr. E. A. Park, an outstanding member of the Johns Hopkins Medical School faculty has recently observed from very careful autopsy records in a large Baltimore hospital, that among a large group of cases showing less than one per cent of ante mortem detection of rickets or scurvy, careful examination of the bone marrow revealed an incidence of rachitic lesions in about forty-five per cent of the cases, and lesions resulting from vitamin C deficiency in twelve per cent of the cases.

A recent paper by Burke, Beal, Kirkwood, and Stuart, of the Harvard Schools of Medicine and Public Health, showed the following remarkable correlation: When the diets of mothers during gestation were rated into three groups, from "excellent" to "fair" and "very poor", the infants of these mothers who were rated as "superior" were found to be distributed in the ratio fifty-six, thirty-five and nine per cent, respectively. The infants rated as "poorest", however, for the same three groups of mothers were distributed in the ratio three, eighteen, and seventy-nine per cent, respectively. There were forty-four per cent of pre-eclampsia cases among the mothers in the lowest of the three groups, and not a single case of pre-eclampsia among the mothers on "good" or "excellent" diets.

Secondly, about one-half of all human endeavor is still required to provide food. The problems related to food production and use are therefore fundamental to our national and international economy.

No other group has played so prominent a part in advancing the science of nutrition as the chemists. In the post-war period, I believe there will be a far greater number of chemists working in the field of

nutrition than ever before.

Nutrition is very largely a biochemical science and therefore calls for specialized training. An interest in things of a biological nature is especially important. Medical institutions, agriculturalists, food producers, processors and distributors, teaching institutions, the chemical industries, the pharmaceutical industries, and basic research institutions will need many more chemists than have been available, with specific training in the science of nutrition.

To meet their responsibilities, they should, in most cases, have their Ph.D. degrees in chemistry, supplemented by post-doctorate experience, either in outstanding pure research laboratories or in industry

The organization of the Nutrition Foundation by leaders in the food industry provides good evidence of the increasing need for highly trained chemists to work on major problems related to foods and nutrition. By pooling their funds, now over one and one-quarter million dollars, and organizing their research program on a nation-wide basis, they are stimulating and supporting in a very efficient way, both research and education.

In addition they are laying the foundation for scientific guidance of the industry and making a substantial contribution to better public health. Already about two hundred young people are receiving advanced training and research experience in the science of nutrition through the Foundation's eighty-four fellowship grants to forty-one institutions. Many of the grants, even to widely separated universities, are closely coordinated in their attacks on major problems.

The type of organization and program built up by the Nutrition Foundation is already serving as a pattern for several other industries to follow. These plans by which industry will undertake nation-wide support of fundamental research in university laboratories, supplementing the more applied forms of research in their own laboratories, should mark the beginning of a new era in our scientific development.

A few men, fearing competitive interference with the need for research support in industrial laboratories, have misconstrued the intent of executive officers in setting up such programs. I am confident that the increasing support of exploratory or fundamental research will lead promptly to increased support of research within the participating industrial organizations. The trend is already clearly evident among the firms in the Nutrition Foundation.

The areas where chemists are likely to make their greatest contributions are probably of the following nature:

1. In working out basic principles in the science of nutrition so that sound applications in agriculture, medicine, and the food industry can follow;

2. In developing better food production programs, through the applications of science to agriculture;

3. In improving food processing and distribution practices; and

4. In working with physicians and public health officials to provide better means of detecting, measuring and correcting nutritional disturbances.

The first field is, of course, the one that will make the greatest contribution to the community at large in the long run. It augurs well for the food industry of America when its business executives recognize the need of supporting independent, exploratory research on a long-time basis.

The following examples will indicate some of the major problems of a basic or exploratory nature that are likely to occupy the attention of increasing numbers of chemists during post-war years:

Finding which and how much of each of the essential nutrients is necessary for optimum human and animal nutrition.

Dr. Rose and others are making excellent headway in determining which of the twenty-two or more amino acids in proteins must be supplied to the human body. Dr. Almquist and others are carrying out similar work on chicks. The figures for humans stands now as at least eight, compared to ten required by rats, but I am sure that Dr. Rose would agree with me in saying that there is much work ahead before the problem is completely solved on a quantitative basis.

There will remain such problems as: How can each of the amino acids be measured accurately and quickly in foodstuffs and in tissues taken from experimental animals? What is the function of each amino acid in the body? How much of each is supplied in our common foodstuffs? What special provisions should be made in treating diseases that interfere with or can be influenced by protein metabolism?

Again, we know very little about the human requirement for several of the fourteen or fifteen known vitamins. Probably only a few vitamins remain to be identified, so far as experimental animals are concerned; but as indicated in the case of amino acids, to find which ones are essential in a qualitative sense is only a beginning.

There should be accurate, inexpensive ways of measuring each; the quantitative requirement of each should be known; and modern physiology and scientific medical practice demand that the function of each and its relation to other re-

actions in the body should be known. In addition, a variety of practical food sources for each nutrient should be known.

The role of the mineral elements in nutrition represents a field of basic importance for the chemist, even though the Midas' touch or the Philosopher's Stone miracles that seem to catch public attention relative to the vitamins are not so evident. There is an abundance of evidence to show that deficiencies of iron, iodine and calcium are important causes of lowered health in America.

But beyond the zone of recognized deficiencies, the biochemist, the physiologist and the physician need to know which and how much of the elements are essential for normal health in man and in domestic animals, and what the functions of each are, inside the body.

To illustrate how far we are from knowing even elementary things about mineral requirements and functions, there was, at the beginning of the war, distinct uncertainty regarding both the quantity of salt that a soldier should have when operating in a tropical environment and practical ways of meeting the need without causing nausea or other types of upset.

Judging from animal and plant studies, one might estimate that the human body requires about fifteen mineral elements for normal functioning. How far we have to go can be visualized in comparison with the present chloride, iron, calcium and iodine situation, where the elements have been recognized as essential since before the turn of the century, but every biochemist, physiologist and physician knows that our detailed knowledge of how they function in the body is far from complete.

Not to be facetious, it is literally true, for example, that to function normally a man's stomach, if it is like a rat's stomach, must be lined with zinc (combined with protein in the cells of the wall to form an enzyme), but we have only a glimpse of how it works in relation to what goes on in the stomach wall.

In the development of better food production program, recognizing that predictions are always hazardous, such items as these should offer opportunities for the chemist:

1. Adequate supplies of powdered and evaporated milk of high nutritive quality, good flavor, and good keeping qualities. The old idea of planning so that surplus products went into these channels as "by-products" is no longer acceptable. They are major products that offer promise of extensive development. A low-cost, superior product adapted scientifically for infant feeding would make a first-rate contribution to human betterment in nearly every section of the world.

2. Vegetables such as potatoes, corn, beans, tomatoes and cabbages of higher nutritive value than those now used should be produced without sacrificing yields, shipping quality or flavor. By plant breeding and control of soil conditions, the content of vitamins, oils and proteins can probably be increased greatly or modified to meet special demands. Dr. Zscheile at Purdue University, Dr. Burkholder at Yale University, and Dr. Maynard at Cornell University, for example, are making very promising headway on such problems.

3. Fruits such as apples, peaches, and small berries offer similar opportunities for great improvement through selective breeding for vitamin C and A content, and this should be done in parallel with whatever improvements are possible in flavor, yields, and other desirable qualities.

4. By demonstrating superior nutritive value and superior acreage yields, such items as dry, green or sprouted soy beans can be developed to the point of greatly increasing our intake of food high in nutritive value, with low cost to the consumer. I do not know of any other crop that would contribute so much as the soy bean toward achieving good nutrition in America, with low cost. Enough preliminary work has been accomplished, such as finding suitable varieties and educating a portion of the public, that I believe the time is ripe for major developments in establishing this item in the American dietary.

There can be no doubt that very wasteful practices are still being followed in food processing and distribution. On the whole, however, industry has been far more alert to this situation than the individual farmers and householders. Retail shop and institutional cookery practices still involve enormous mineral and vitamin losses from foods—losses that canners and large processors have learned to avoid.

Some practical way must be found to escape from the dilemma of over consumption of foods that are deficient in essential nutrients. There are several ways of solving the problem. Three constructive approaches appeal to me as being practical. I believe each method should be pressed as rapidly as good judgment will permit:

1. Adapt or develop the flow of food products so that each item consumed will carry as much of a variety of nutrients as practical considerations will permit.

2. Increase the consumption of foods that contain high concentrations of nutrients that are often deficient in other foods.

3. Continue to educate the public, both lay and professional, regarding elementary principles of nutrition, so that they will be con-

scious of their food requirements and of the close relation between food intake and health.

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On top of this evidence was the conclusion, agreed to by nearly all nutrition authorities, that between a third and a half of our population was not receiving enough vitamins and minerals for their best health. There was also evidence that the protein intake might be improved.

The conclusion seems clear that research men responsible for product development have an opportunity to develop products and policies that will minimize the chance that individuals will consume too high a proportion of the refined foods. In so far as the refined products are consumed along with such foods as milk, fruit, nuts, meat, eggs, leafy foods and whole cereals (rich in minerals and vitamins), the risk of causing malnutrition is proportionately decreased.

The enrichment of flour and bread represents an attempt to improve the situation by adding synthetic vitamins and minerals to foods that have been refined to meet practical considerations. The latter have been based primarily upon public acceptance. There is no mistaking the fact that attractive food products of high nutritive value can be made available to the public, but the intricate relations to flavor, stability, price, simplicity of handling, and public acceptance cannot be overlooked either.

Again, if the intake of vitamin and mineral-rich foods can be increased fairly uniformly among the population, by the greater use of such items as tomatoes, green leafy foods, whole cereals, milk, meat, eggs, liver, yeast, citrus fruits, soy beans and sweet potatoes, then there would be less risk for a person who uses conventional quantities of highly refined foods becoming deficient in any single nutriant.

Industries dealing primarily with refined products therefore have a common interest with others in improving the national dietary. All men with a normal sense of public trust know that business and government policies must always be sensitive to the public's interest in good health.

Supplementing such corrective procedures, much can be done by keeping professional and administrative people alert to the basic importance of achieving good nutrition, whatever the means. The chemist can usually get the facts

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There will always be temptations to sacrifice nutritive quality for the sake of immediate gains in such directions as lower cost, better keeping quality, simpler packaging, greater uniformity and easier distribution. These are practical matters that demand consideration by everyone, from the farmer to the consumer.

From close association and many frank discussions with leaders in business and in government agencies, however, I am confident that these executive officers will resist the tendencies toward short-sighted policies that jeopardize public health.

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Over the past fifteen years the growth of the aliphatic chemical industry has been rapid. Previously there were only about a dozen products being made commercially, while today Carbide and Carbon Chemicals Corporation is making at least 160 that are being shipped. About 40 of these require transportation in tank cars.

Of the dozen major chemical families—the alcohols, glycols, aldehydes, ketones, acids, and so on—at least several of the lower molecular weight members are now produced in commercial quantities.

Alcohols

We are producing industrial quantities of fourteen alcohols ranging from methanol to heptadecanol. This does not count the several dozen glycols, glycol-ethers, alkanolamines, and other polyfunctional derivatives containing at least one alcohol group.

A new product added in 1943 to this growing family is trimethylcyclohexanol—an alcohol that forms beautiful crystals at about room temperature. Trimethylcyclohexanol has a distinct aromatic odor which resembles that of menthol, and its formula is not unlike that of menthol too. The hydrocarbon nature of the trimethylcyclohexyl group suggests its introduction into other products to increase their oil solubility.

In recent months compounds containing the 2-ethylbutyl group have grown in commercial importance. They supply valuable derivatives in

this six-carbon atom range with its characteristic boiling points, solubilities, and evaporation rates. At present, the ethylbutyl compounds are replacements for many of the common materials, such as the amyl compounds, that are more limited in supply.

Ethylbutyl "Cellosolve" is a high-boiling (197°C.) solvent useful for many applications now employing compounds such as diethyl "Carbitol," cyclohexanol, or methyl "Carbitol." It is of particular interest where a lower water solubility or greater hydrocarbon solubility than that of the lower alkyl glycol-ethers is desirable. It shows promise as a mutual solvent or coupling agent for making homogeneous two phases that are ordinarily incompatible with each other. Thus it should be tried in dry-cleaning soaps, soluble oils for textile and leather applications, and metal-cutting and insecticide oils.

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An alcohol that has become very important to the war effort is ethylhexanol. At the present time, the largest use of ethylhexanol is in the manufacture of the plasticizer diethylhexyl phthalate which has been trademarked as "Flexol" plasticizer DOP and is mentioned under "Esters." Both ethylhexanol and its phthalate have become so important to the war effort that their supply is allocated monthly by the War Production Board.

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a releasing agent to molds in which rubber parts are formed, causes a perfect, quick release when the mold is opened.

They can also be used for lubricating textile machinery so that any contaminating lubricant on the goods can be easily removed with water alone. Industrial automatic electroplating equipment has been lubricated with a grease based on the "Carbowax" compounds. In one installation, the conveyors are directly over the plating tanks and paraffinic greases formerly fouled the bright nickel baths. Apparently no harm results if some of the water-soluble "Carbowax" compound occasionally gets in these baths.

As a pigment binder, "Carbowax" compound 4000 makes possible water-soluble crayons. Marks on wallpaper can be removed with plain water.

As New Pharmaceutical Bases

Approval of these products by the Food and Drug Administration for use in products for topical application to humans has led to an interest in them as ointment bases. They do not support mold growth. They are good solvents for such pharmaceuticals as the sulfa drugs. The "Carbowax" compounds are also interesting as water-soluble bases for cosmetic creams and in lotions they provide a powder base film. They are also suggested as a component of hair dressings or conditioners which are applied to the hair for permanent waving. As carriers for medicaments single oral doses in animals have indicated that they were of a low order of toxicity. However, it should not be assumed that the "Carbowax" compounds are safe for internal consumption.

A product intermediate in melting point, or one with greater hygroscopicity or lower melting point, can be achieved by a judicious mixing of these two compounds and lower members of the polyethylene glycol series.

Water-Soluble Glycol-Cellulose Films

Synthetic film-forming materials that are water-soluble are becoming of interest as replacements for natural gums, proteins, and the like. Semi-commercial quantities of a new glycol-cellulose product of this nature have been available, under the trade-mark "Cellosize," in the form of an aqueous solution containing 10 per cent of hydroxyethyl cellulose. Its viscosity is about equivalent to a winter grade of lubricating oil but decreases on warming. It does not gel at higher temperatures as does methyl cellulose solutions.

"Cellosize" hydroxyethyl cellulose solutions are compatible with other water-soluble film-forming materials such as gum arabic, gelatin, and starch, thus making possible a high degree of modification through the choice and amount of additive used.

On drying, "Cellosize" WS produces an almost colorless, nearly transparent film of great clarity and higher tensile strength than is obtained from commercial methyl cellulose solutions. In contrast to polyvinyl alcohol, the hydroxyethyl cellulose film after drying is completely soluble in either cold or hot water and has superior light and heat stabilities.

The water solubility of films made from "Cellosize" solutions can be modified by the addition of glyoxal before drying. Thus, when five parts of a 30 per cent glyoxal solution are added to 50 parts of "Cellosize" hydroxyethyl cellulose and the mixture is filmed and dried, a clear glassy product is obtained. This is not affected by water except after long soaking. It is very resistant to oils, greases, and organic solvents. These films, impervious to both the liquid and vapor phases, are of interest to the container industry for dehydrated foods, lubricating oils, and other unctuous products.

For Increasing Wet Strength of Paper

The co-acetal of hydroxyethyl cellulose, glycerol, and glyoxal greatly increases the wet strength of paper. Thus, the wet strength of a high grade of viscose-strengthened paper toweling was increased 125 per cent by the addition of enough of this mix to increase the dry weight 2.7 per cent. The dry strength was raised 25 per cent.

The adhesion of "Cellosize" solutions to paper, wood, leather, rubber, cloth and concrete surfaces is good. These surfaces can thus be given a temporary resistance to oily materials with a coating of this product. It also seems to be able to bind large amounts of pigments and may be useful in water paints.

Possessing the widest range of chemical activity of any class of organic chemicals, aldehydes are widely used in industry as chemical building blocks.

Glyoxal Available Commercially

Glyoxal is now supplied as a 30 to 40 per cent aqueous solution and in the form of the white crystalline bisulfite addition product. Since glyoxal is the simplest dialdehyde, it behaves similarly to formaldehyde. The presence of two functional groups, however, permits cross linking and other reactions not possible with monoaldehydes. In common with formaldehyde and other aldehydes, glyoxal may be easily oxidized.

Aqueous solutions of this dialdehyde reduce alkaline silver and copper solutions. Acetals are formed in the usual manner with alcohols, and condensations occur when it is reacted with other compounds containing carboxyl or amino groups. Thus it can be used to insolubilize protein glues, casein, gelatin, albumin, and high moleculer weight

polyalcohols such as polyvinyl alcohol.

The relative non-volatility and minimum odor suggests the use of glyoxal in hardening and insolubilizing casein paper sizes. The resultant wet strength of such treated paper is higher than when formaldehyde is used. Glyoxal forms the usual aldehyde-addition products with such compounds as sodium bisulfite, hydrocyanic acid, ammonia, and hydrazines. It contains the chromophore group O-C-C-O and may serve as a modifying agent or intermediate in the synthesis of dyes to yield insoluble colored materials. These same reactions may also serve in the synthesis of compounds of interest to the pharmaceutical industry. The literature is replete with suggestions and ideas. They include the use of glyoxal in the synthesis of indigo and substituted indigos, pyrazine carboxylic acids, allantoin, hydantoin, and other chemical products.

Ketones

Another chemical with newer applications is isophorone in connection with the "Vinylite" resins.

Powerful Solvents for Vinyl Resins

Isophorone was introduced in 1940 and quickly grew to the stage requiring tank-car shipments. In spite of its high boiling point, 215.2°C. (which we usually associate with decreased solvent power), isophorone is one of the most powerful ketone solvents for nitrocellulose and one of the best-known solvents for copolymer vinyl resins. It has the high dilution ratios for nitrocellulose of 6.2 with toluene and 5.1 with xylene, and solutions of ½-sec. R.S. nitrocellulose containing 45 per cent solids may be made at room temperatures. Solutions of "Vinylite" resins may be made in which the solids content approaches 30 per cent without exhibiting any tendency toward jelling, whereas not more than 20 per cent can be introduced in a corresponding mixture of acetone and toluene without causing high viscosity effects.

Since isophorone contains both a ketone group and a double bond in its structure, it makes an excellent starting material in the manufacture of many other products. As a typical ketone, it will react with aldehydes, hydrocyanic acid, amines, and substituted nitrogen derivatives. The double bond makes possible the addition of halogens, mercaptans, halogen acids, and alkyl amines.

Esters

We have already mentioned the new ester "Flexol" plasticizer DOP, of which millions of pounds are being produced for use in the plastics industry. The plasticizer content in some of the flexible plastics runs nearly as high as fifty per cent. Many plastic products for use in the temperature extremes of this global war have to be operative

with the temperature range from -40° to 150°F. without undue change in properties.

The outstanding characteristic of "Flexol" plasticizer DOP is its extremely low volatility over a wide range of temperature. It is compatible with nitrocellulose, polystyrene, and urea-formaldehyde resins as well as the buna and neoprene synthetic rubbers. Films of "Vinylite" resins plasticized with it have good low-temperature flexibility, satisfactory light stability, and excellent electrical properties. Because of its favorable dielectric constant and power factor, "Flexol" plasticizer DOP is particularly useful in cable coating compositions and in related applications where these electrical properties are important. It has also been found to give the most satisfactory toughness and flexibility at temperatures as low as 0°C. in cable coating compositions.

Although available commercially for several years, ethyl silicate has begun to mature with the impetus of the war effort. This combination of organic and inorganic esters is supplied as the pure tetraethyl orthosilicate which is a colorless liquid and as a "condensed" grade which contains higher polymers.

Mold Binder For Casting Alloys

Ethyl silicate is being used in carload quantities as a binder for molds in the precision casting of high-melting alloys. Before the war it was mainly used in casting dental work and surgical appliances such as bolts and screws for the setting of fractures and that are left in place after healing. But war need has broadened the scope of this technic. Its field appears to be in the making of small, intricate castings of the type that cannot be economically machined or forged.

The commercial value of ethyl silicate depends upon its ability to deposit silica on hydrolysis. To convert ethyl silicate to a suitable silica bonding medium, it must be mixed with sufficient water to hydrolyze it. Since ethyl silicate is not miscible with water, a mutual solvent such as alcohol, acetone, or trichlorethylene is used. It can be stored for many months in a partially hydrolyzed solution by mixing 50 volumes of ethyl silicate with 30 volumes of alcohol or "Synasol" solvent, and 1 volume of water. At least twenty-four hours after the preparation of this solution, or when ready for use, one additional volume of water is mixed with nine volumes of this solution to complete the hydrolysis. If it is desirable to speed the hydrolysis, the reaction may be catalyzed by the addition of one-tenth normal hydrochloric acid, the speed of the reaction depending upon the quantity of the acid present. The alcohol set free when the silica is deposited is gradually volatilized

at room temperature and the very sticky colloidal silica dries to a hard, vitreous-like enamel.

It will be recalled that the "Tergitol" penetrants are the sodium sulfate derivatives of higher, synthetic alcohols. Mostly they are secondary alcohols with the alcohol group almost in the center of the carbon chain. These sulfates are many times more potent wetting agents than those with the sulfate group on the terminal carbon atom.

Wetting Agents in Antiseptics

The medical profession has found the use of these wetting agents with bactericides and antiseptics increases the potency of the pharmaceuticals four- to ten-fold.

A purified form of this sulfate is now commercially available under the trade-mark "Tergitol" as a slurry of 40 per cent of the pure sulfate suspended in water. It has good detergent powers. It also has an advantage over soaps in that it is not affected by acids or hard water.

Amines

An interesting new aliphatic amine is tetraethanolammonium hydroxide, a white, crystalline solid that is soluble in water and melts at 123°C. The commercial product is an aqueous solution, containing 40 to 41 per cent of the hydroxide. This compound approaches the fixed alkalies in alkalinity. Although its aqueous solutions at normal temperatures are relatively stable, this compound decomposes on heating to form weakly basic ethanolamines. Taking advantage of this property, this hydroxide is useful in processes where it becomes desirable to destroy a strong base that has been useful at lower temperatures. As an alkaline catalyst it could be destroyed when desirable by heating the reaction mix. It is an excellent solvent for certain types of dyes.

A newcomer to the growing family of ethanolamines is methyldiethanolamine, a liquid with a characteristic amine-like odor and miscible in water and benzene. Being a tertiary amine with two highly active ethanol groups, the compound has several points of attack for the introduction of other groups. Methyldiethanolamine is suggested as a raw material in the manufacture of textile chemicals and dyestuffs, insecticide intermediates, and emulsifying agents.

For example, it is a convenient starting material in the production of a synthetic morphine substitute trade-marked "Dermerol" which has sedative, analgesic and antispasmodic effects without causing depression of the central nervous system. Nitrogenous ethers, such as those obtained by adding octadecyl chloride to one of its hydroxyl groups, are useful as assistants in mercerizing, wetting, dyeing and softening textiles.

In years to come another amine

—morpholine—may be a common household product. Although it boils at 128.9°C., its dilute water solutions boil or evaporate with little change in composition. Thus a constant alkalinity is maintained both in the solution and in the distillate.

Prevents Tarnishing of Silverware

Such a phenomenon has many everyday applications. A one per cent aqueous solution of morpholine is being used to inhibit the tarnising of silverware. In areas where the sulfur content of the atmosphere is high—such as New York City—jewelers expose a sufficient surface of the morpholine solution within the storage or display space so that enough of the solution is evaporated per unit time to inhibit sulfide formation.

Prevents Corrosion of Boiler Water

Under the trade-mark "Morlex," a product that is essentially morpholine is also being used in the boiler water in return-condensate steamheating systems, where the constant alkalinity in liquid and vapor phases enables it to inhibit corrosion. A similar application has been reported where a few drops added to medical sterilizers prevents the rusting of instruments.

Morpholine forms soaps with fatty acids that are excellent emulsifiers for use in rubless floor polishes, paper coatings, and paint and insecticide emulsions where they benefit from the use of an emulsifier that becomes ineffective on drying. The moderate volatility and weak basicity of morpholine causes it to evaporate gradually from the drying emulsion film, leaving it resistant to subsequent water treatments. A floor wax polish can thus be made water-resistant because the original emulsifier no longer exists.

Ore Flotation Agents

Amine-fatty acid condensation products have been growing in diversity and volume in recent years. Amine 220 has been found useful in certain flotation procedures where it is desired to float oxides.

Sulfur Compounds

Most of the commercial organic products today are oxygenated, although a good start has been made in the great field of nitrogen compounds. There is still another great field, the sulfur compounds. There are two new sulfur compounds.

One of these, thialdine, is available in carload quantities. It is a promising heterocyclic intermediate containing both sulfur and nitrogen in the ring. It is a colorless, crystalline solid melting at 44° to 46°C. The odor of the free base resembles that of hydrogen sulfide but this is much reduced in its salts. It is soluble in alcohol, ether, and hydrocarbons but almost insoluble in water. While thialdine has been known for a long time (it was first made by Wohler and Liebig about

1847), comparatively little has been recorded in the literature regarding its chemical reactions. The products which can be made from thialdine include salts of strong acids, a disulfonic acid obtained by oxidation, an N-methylated product from methyl iodide, and quinoline from fusion with calcium oxide.

The second sulfur compound, thiodiethylene glycol, is a non-volatile, hygroscopic liquid which is neutral in reaction and completely soluble in water.

New Dyestuff Solvent

Because it is an excellent solvent for basic, acid, and vat dyestuffs used in textile printing, it is marketed under the trade-name "Kromfax" solvent. It may be generally employed to replace all or part of the glycerol, acetin, diacetin, or triacetin which are commonly used to dissolve these colors. Taking advantage of its excellent solvent properties, it is also used to clean printing rolls on which dye pastes have become laked and precipitated in the pattern. Small amounts of "Kromfax" solvent impart excellent stability to dyestuff pastes and even allow the reuse of old printing pastes which have become laked.

The two hydroxyl groups in "Kromfax" solvent are alcoholic in nature and capable of most of the reactions typical of these groups such as esterification.

Dichlorethyl formal, until recently had not been made in the large quantities required to make self-sealing fuel tanks for aircraft. It is now being shipped in tank-car lots and is available as a chemical intermediate. Although not strictly an aldehyde, dichlorethyl formal can be made to liberate formaldehyde by suitable treatment, hence may be used to advantage where a gradual development of this aldehyde is desirable.

1, 1, 2-trichlorethane is a chlorinated compound that became available during 1943, and it is a colorless, volatile liquid soluble in alcohol, ether, and most organic solvents but difficultly soluble in water. It is classed by the Underwriters Laboratories as non-flammable at ordinary temperatures. Its fire hazard is very small compared to trichlorethylene and ethylene dichloride. Trichlorethane is stable under ordinary conditions of use and is a good solvent for cellulose acetate and most oils, fats, and waxes as well as natural and certain types of synthetic rubber.

Hence it offers possibilities as an extractant and for other applications that are carried out in closed or well-ventilated systems to prevent toxic quantities of the solvent from being vaporized. It has been found less toxic than alphatrichlorethane, CH_3CCl_3, and tetrachlorethane (acetylene tetrachloride) but more toxic than trichlorethylene, ethylene di-

chloride, or carbon tetrachloride.

Since dichlorethyl ether is now available only on orders carrying preference ratings, another chlorinated ether has become important as a replacement. Dichlorisopropyl ether, a colorless liquid, has properties very similar to dichlorethyl ether, however, it is less soluble in water. It is miscible with practically all oils and organic liquids and is an excellent solvent and extractant for fats, waxes, and greases. In textile processes, where high temperatures are encountered, dichlorisopropyl ether assists the action of soap solutions without excessive quantities being vaporized from the hot solutions.

Because of the excellent solvent action of dichlorisopropyl ether, it may be used to advantage in paint and varnish removers, spotting agents, and cleaning solutions. This chlorinated ether also offers numerous possibilities for use in organic synthesis as an intermediate in the manufacture of dyes, resins, insecticides and certain pharmaceuticals. Like other organic chlorides, it reacts with ammonia to form amines, and with cyanides to form nitriles, which are starting points in the synthesis of mono- and di-carboxylic acids. Because dichlorisopropyl ether has two extra methyl groups, these other products made from it tend to be less water soluble and more oil soluble than those made from dichlorethyl ether.

Progressive Research

Our knowledge of the full usefulness of these new chemicals is limited. Although certain properties will suggest to us some obvious fields of interest, it is true that many of the major applications for our chemicals were developed independently by research men who saw in one of their properties something of value for a particular need. One of the fascinating facts about industrial chemistry is that a new chemical will frequently replace one that has come to be considered indispensable, only to be replaced a little later by another chemical which in turn becomes indispensable because its properties are more nearly ideal.

Science Talent Search

The third annual Science Talent Search is now being conducted. Tests are being given to high school seniors to qualify them for further competition. The forty finalists will then compete for the two $2400 scholarships, eight $400 scholarships, and additional awards totaling $3000, which comprise the Westinghouse Science Scholarships.

COUNCIL

OFFICERS

President, Gustav Egloff
Vice-president, Donald Price
Secretary, Howard S. Neiman
Treasurer, Frederick A. Hessel

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W. D. Turner

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Niagara
A. W. Burwell

Philadelphia
J. M. McIlvain

Washington
T. H. Tremearne

Chicago
Howard Adler

Miami Valley
Harvey G. Kittredge

Baltimore
Maurice Siegel

November Meeting

A meeting of the National Council of The American Institute of Chemists was held on Wednesday, November 17, 1943, at The Chemists' Club, 52 East 41st Street, New York, N. Y., at 6:30 p.m. President Egloff presided.

The following officers and councilors were present: Messrs: G. Egloff, H. L. Fisher, R. J. Moore, R. E. Kirk, F. D. Snell, A. Lloyd Taylor, and M. Toch. Mr. T. S. McCarthy and Miss V. F. Kimball were present.

The minutes of the previous meeting were approved.

Dr. Egloff reported on his meeting with the newly organized Baltimore Chapter on October 28th.

Upon motion made and seconded, the application for a charter for the Baltimore Chapter was confirmed.

Dr. Egloff reported on his meeting with members of the Institute in Pittsburgh on November 14th.

and on his meeting with the members of the Pennsylvania Chapter on November 16th in Philadelphia.

Upon motion made and seconded, the report of the Treasurer was accepted.

Upon motion made and seconded, it was decided to publish the names of all those elected since January, 1943, in THE CHEMIST for January, 1944, as a supplement to the roster.

Upon motion made and seconded, the amendments to Article X, Section 1, of the by-laws, as made at the September meeting of the Council, were ratified.

Dr. Egloff announced that he will be in New Orleans December 16th to 18th, and hopes to meet with the INSTITUTE members in that area.

It was suggested that the National office of the INSTITUTE arrange a list of speakers who would be available to the Chapters.

The Editor was requested to send the Chapter secretaries notice of the dead-line for the publication, so that minutes of their meetings and dates of future meetings could be published in THE CHEMIST.

It was suggested that a notice appear in THE CHEMIST asking INSTITUTE members who are traveling to offer to make talks at the various chapters.

The Chapter secretaries were urged to write to one another and interchange ideas for programs.

A motion was made that three regional vice-presidents be elected as officers of the INSTITUTE, and that steps be taken to so amend the Constitution.

This motion was amended to designate one vice-president from the area west of the Rocky Mountains; one vice-president for the area between the Rocky Mountains and a line drawn from the westerly border of Ohio north and south; and one vice-president from the area east of this line.

During the discussion, it was brought out that we now have provision for Chapter representatives and that these could better serve as contacts between the National Council and the members of the various sections, than to amend the Constitution to create a new class of representatives by regional vice-presidents.

Following the discussion, the motion was tabled, and the councilors were requested to give thought to the matter and be prepared to consider it again at the December meeting of the Council.

Upon motion made and seconded, the following new members were elected:

FELLOWS

Cooke, Theodore F., Jr.
(1943), *Captain Corps of Engineers, U. S. A., Director of Materials Laboratory,* The Engineer Board, Fort Belvoir, Virginia.

Front, Jacqueline S.
(1943), *Assistant Fellow,* Mellon Institute, Pittsburgh, Penna.

Gelman, George
(1943), *Research Chemist,* Quartermaster Corps (Captain), QMC Subsistence Research Laboratory, 1819 Pershing Road, Chicago, Illinois.

Grim, John M.
(1943), *Research Chemist,* Mellon Institute, Pittsburgh, Penna.

Oswald, Richard K.
(1943),*Chemist,* Lowe Brothers, E. Third Street, Dayton, Ohio.

Tubis, Manuel
(1943), *Assistant Chemist,* U. S. Food and Drug Administration, Custom House, Philadelphia, Penna.

ASSOCIATES

Kahn, Gloria C.
(A.1943), Women's Army Corps, Fort Des Moines, Iowa.

Stern, Edward
(A.1943), *Medical Laboratory Technician,* U. S. Army Medical Depot, 976 Medical Hospital Ship Platoon, Camp Kilmer, New Jersey.

The membership report was read, showing that we have a total of 1795 members.

The membership brochure of the INSTITUTE was discussed and Mr. McCarthy was asked to prepare a small booklet giving information about the INSTITUTE.

The Kilgore bill was discussed in relation to action taken by other societies.

A meeting of the Jury on Medal Award was requested for the evening of the January Council meeting.

Dr. Snell reported for the Committee on Licensure.

There being no further business, adjournment was taken.

CHAPTERS

Baltimore

Chairman, Albin H. Warth *Vice-chairman,* Walter H. Hartung

Secretary-treasurer, Edward M. Hanzely

3816 Kimble Road
Baltimore 18, Maryland

Council Representative, Maurice Siegel

News Reporter to THE CHEMIST, Ralph Lamenzo

Chicago

Chairman, Hilton I. Jones *Vice-chairman,* H. R. Kraybill

Secretary-treasurer, Charles L. Thomas

Universal Oil Products Company
Riverside, Illinois

Council Representative, Howard Adler

Los Angeles

Chairman, R. J. Abernethy

Secretary-treasurer, Imo Baughman Simpson

640 N. Kenmore Avenue
Los Angeles, California

New York

Chairman, M. L. Hamlin *Vice-chairman,* Franklin H. Bivins

Secretary-treasurer, Lloyd W. Davis

National Oil Products Company
Harrison, New Jersey

Council Representative, A. Lloyd Taylor

A meeting was held on November nineteenth at 2 Park Avenue, New York, N. Y. with an attendance of over one hundred and fifty members and guests, Dr. M. L. Hamlin presided.

Dr. Charles G. King, scientific director of The Nutrition Foundation, spoke on "The Chemist's Place in Postwar Nutrition". Harry B. McClure, manager of the Fine Chemicals Division of Carbide and Carbon Chemicals Corporation, discussed the "Newer Products of the Aliphatic Chemical Industry", and showed samples of these products. These papers are given elsewhere in this issue of THE CHEMIST.

Miami Valley

Chairman, E. L. Luaces *Vice-chairman,* J. M. Purdy

Secretary-treasurer, John R. Fisher, Jr.

Chemical Development Corporation
314 W. 1st Street, Dayton 2, Ohio

Council Representative, Harvey G. Kittredge

A meeting of the Miami Valley Chapter was held in Dayton, Ohio, on November sixth, at which Dr. Gustav Egloff welcomed the new chapter into THE AMERICAN INSTITUTE OF CHEMISTS, and presented it with a charter. He then spoke of the accomplishments and plans for the future of the INSTITUTE.

Niagara

Chairman, Maurice C. Taylor *Vice-chairman,* Lawrence H. Flett
Secretary-treasurer, M. R. Bhagwat
1104 Ferry Avenue
Niagara Falls, New York
Council Representative, Arthur W. Burwell
Alternate. Lothar A. Sontag
Reporter to THE CHEMIST, Frederick Koethen

Pennsylvania

Chairman, Clinton W. MacMullen *Vice-chairman,* Glenn E. Ullyot
Secretary-treasurer, Kenneth E. Shull
23 Bala Avenue
Bala Cynwyd, Pennsylvania
Council Representative, John M. McIlvain

The Pennsylvania Chapter held the first meeting of the current season on October 26th at Mitten Hall, Temple University.

Following an informal dinner and short business meeting the vice chairman, Dr. Glenn Ullyot, introduced Mr. Charles L. Gabriel, vice president of the Publicker Alcohol Corporation. Mr. Gabriel spoke on "Oxygenated Solvents; their Growth and Uses in Synthesis."

Prior to 1920 there were oxygenated solvents available commercially. Those in use were methane and acetone, obtained by the dry distillation of wood; and ethyl alcohol, produced by the yeast fermentation of sugars. Ethyl alcohol was perhaps the first organic solvent known, there being record of its use in ancient times.

During the early nineteen twenties the development of solvents was rapid. Butyl alcohol was produced by the bacterial fermentation of cornstarch. Later it was made synthetically from acetaldehyde. Methanol was made synthetically by hydrogenating carbon monoxide. The various glycols were prepared from the corresponding olefins.

These solvents, and others, may be considered to be the raw materials for the manufacture of a large number of industrial products:

1. From ethyl alcohol:

a. Acetic acid used as a solvent; in dyeing of textiles; in tanning; as cellulose acetate in the manufacture of photographic film and rayon.

b. Acetaldehyde, used in the synthesis of butyl alcohol.

c. Butadiene, used in the manu-

facture of synthetic rubber.

d. Styrene, used in the manufacture of synthetic rubber.

2. From methyl alcohol:

a. Formaldehyde, used in the manufacture of plastics; in the manufacture of anti-freeze; in tanning.

3. From Butyl alcohol:

a. Esters of butyl alcohol, suitable as solvents for lacquers.

A discussion followed Mr. Gabriel's interesting talk.

Washington

President, L. F. Rader, Jr.

Vice-president, L. R. Heiss

Treasurer, T. H. Tremearne

Secretary, Ernest J. Umberger

207 Albany Avenue, Takoma Park, Maryland

News Reporter to THE CHEMIST, S. W. Griffin

Council Representative, T. H. Tremearne

A meeting was held at the Wardman Park Hotel, Washington, D. C., on November fifteenth.

A motion picture entitled "Potash Production in America", was presented by Mr. J. D. Romaine of the American Potash Institute. The three reels of color pictures showed several of the largest plants in operation at Carlsbad, New Mexico, and the mining methods employed.

The annual election of officers was held and the new officers are indicated above.

The attendance was not large, due to the decentralization from Washington tc the various regional research laboratories, military absences, and to the withdrawal of Baltimore members to form their own chapter.

The Washington Chapter extends greetings to the newly formed Chapters and wishes them success in their endeavors.

The next meeting of the Chapter will be held on January 15, 1944.

Vincent Eckstein Married

Vincent Eckstein, M.A.I.C., and Miss Marie Heinzelman of Glendale were married October sixteenth at the Savoy Plaza Hotel, New York, N. Y. Mr. Eckstein is an instructor at Brooklyn Polytechnic Institute, Brooklyn, N. Y.

Applications for Membership

For Fellows

Alexander, Allen L.
Senior Chemist, Naval Research Laboratory, Anacostia Station, Washington, District of Columbia.

Blackberg, Solon N.
Medical Director and Director of Research, Nutrition Research Laboratories, 4210 Peterson Ave., Chicago, Illinois.

Dobbs, Carey C.
Industrial Specialist, U. S. Government, Washington, D. C.

Kranz, Frederick H.
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Lidfeldt, Viola
Research Chemist, Pond's Extract Company, Clinton. Conn.

Long, James S.
Chemical Director, Devoe and Raynolds Company, Inc., Louisville, Ky.

Ogilvie, James
Research Chemist, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Othmer, Donald F.
Professor of Chemical Engineering, Polytechnic Institute of Brooklyn, Brooklyn, New York.

Payne, Ralph
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Richards, George H.
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Royal, Lester
Senior Research Chemist, Amino Products Company Division, International Minerals and Chemical Corporation, Rossford, Ohio.

Strouse, George C.
Research Chemist, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Taylor, Walter A.
Assistant Director of Research, Pond's Extract Company, Clinton, Conn.

Withrow, James R.
Consulting Chemical Engineer, Professor and Chairman of Chemical Engineering, Ohio State University, Columbus 10, Ohio.

For Member

Affens, Wilbur A.
Chemist, War Department, U. S. Engineer Corps, Ohio River Division, Cincinnati Testing Laboratory, Mariemont, Cincinnati, Ohio.

Blackinton, Roswell J.
Development Chemist, Western States Lacquer Company, Maywood, Calif.

Dietz, James H.
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets. Philadelphia, Pennsylvania.

Hayes, C. Ellwood, Jr.
Senior Chemist, Charles Lennig and Company, 5000 Richmond St., Philadelphia, Pennsylvania.

La Russo, Violet
Assistant Research Fellow, Mellon Institute, Pittsburgh, Penna.

Morrow, Evan R.
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets, Philadelphia, Pennsylvania.

Russell, Maurice
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets, Philadelphia, Pennsylvania.

Smith, Arthur L.
Research Chemist, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

For Your Library

AN OUTLINE OF ORGANIC CHEMISTRY. By Ed. F. Degering. *Barnes and Noble*. 386 pp. 5½"x8¼". $1.25.

This fourth edition of this well-known book upon organic chemistry, in addition to bringing the former subjects up-to-date, includes new chapters on natural and synthetic fibers, surface active agents and scientific literature; and the former chapters upon the rapidly advancing subjects of heterocyclic compounds and the mechanism of organic reactions have been greatly enlarged. The formula follows that of the previous edition, an arrangement of facts which has met with universal acceptance and appreciation.

Each chapter upon a chemical class of compounds contains detailed information with respect to its chemical and physical properties, its nomenclature and its preparations, and similar information is given with respect to the more important compounds of the class.

While the author suggests the book as a substitute for lecture notes, its value enters into much broader fields and it will be found a most valuable textbook for both the beginner and for those who are desirous of obtaining the latest information regarding any particular organic compound.

ORGANIC CHEMISTRY SIMPLIFIED. By Rudolph Macy. *Chemical Publishing Company*. 1943. 431 pp. $3.75.

The author has attempted to solve the problem of those students of chemistry, who are desirous of acquiring a knowledge of the theoretical foundation of organic chemistry before overloading themselves with actual physical experiments; and the problem of those chemists of more extended experience, who are desirous of augmenting their former acquired knowledge of these basic fundamentals with information arising from later investigations. The author has solved these problems with eminent success.

The book is divided into four Parts, the titles of which are highly suggestive of their contents: The Unique Position of the Atom in Chemistry; The Architecture of Carbon Compounds; The Classification of Carbon Compounds, and Special Topics in Organic Chemistry.

The subject matter of each Part is treated broadly and specifically in a clear, concise manner, pictorially explained by hundreds of formulas and graphs until the elements seem to form compounds in smoothly controlled mechanical movements which are easily understandable. The in-

tricacies of modern chemistry thus become simplified and the reader continues the story with eagerness.

This book can be highly recommended as a source of enjoyment and information to every one interested in chemistry.

The magazine *Flying* is enlarging its industrial aviation section, beginning in January, to sixty-four pages. It will contain technical articles intended for engineers, designers, technicians, and manufacturers, which will also be of interest to chemists who provide basic materials to the industry.

Booklets

"Information Concerning Occupational Classifications" and "Transmittal Memo No. 78, Amendment to Supplement to Activity and Occupation Bulletins", concerning the revised War Manpower Commission procedures, may be obtained from the War Manpower Commission, Washington, D. C.

Interchemical Review, published by the research laboratories of Interchemical Corporation, features articles on "Industrial Viscometers" and "Outline of Surface-Active Agents" in its Autumn, 1943, number.

"Your Future in Chemistry" by V. F. Kimball and M. R. Bhagwat, F.A.I.C., Occupational Monograph 37 in the "American Job Series", published by Science Research Associates, 1700 Prairie Avenue, Chicago, designed to give students information about the various fields of chemistry, may be obtained from the publisher for \$.60. Quantity rates are available on request.

The importance of utilizing flax-straw is discussed in a leaflet entitled "America's Most Valuable Agricultural Waste" by P. G. Gibb. Copies may be obtained on request from *The Textile Colorist*, 233 Broadway, New York 7, N. Y. by mentioning THE CHEMIST.

Timely Petroleum Topics published by Phoenix Chemical Laboratory, Chicago, Illinois, printed a series of articles on "Corrosion" in the April fifteenth to September fifteenth issues, inclusive.

Rutledge-Giacona

Nicholas V. Giacona, A.A.I.C., and Miss Mary E. Rutledge were married on October thirty-first. Both Mr. and Mrs. Giacona are employed as chemists by E. R. Squibb and Sons Laboratories, New Brunswick, New Jersey.

Bright Spot on 5th Avenue

(Or Don't Sell The Chemist Short)

Silken mesh that never knew a worm
Clothes her pretty legs so bright and firm;
Purple plastics scintillating fair
Sparkle from her handbag and her hair;
See her striding swiftly down the street
Flashing bright synthetics on her feet;
Figure shaped in latest fashion brilliant
By butadiene polymers resilient;
As she shows a rationed world defiance;
Enheartened by the lavishness of science.

—Robert Spencer Barnett, F.A.I.C.

Positions Available

CHEMIST—female—for laboratory and control work wanted by manufacturer of cosmetics. Must be university graduate with B.S. degree. One who has majored in organic chemistry with high scholastic record preferred. Experience helpful but unnecessary. Starting salary $2600 annually. Write Box 121, THE CHEMIST.

Meeting Dates

Dec. 6-11. Chemical Industries Exposition. Madison Square Garden, New York, N. Y.

Dec. 9. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Dec. 13. N. Y. Chapter. American Society for Metals. National President Meeting. Speaker Marcus A. Trossman, "Hardenability of Steel and the Effects of Alloys." 2 Park Avenue, (26th Floor), New York, N. Y.

Jan. 10. N. Y. Chapter, American Society for Metals. Speaker, Wendell F. Hess, "The Welding of Aircraft Materials". 2 Park Avenue, New York, N. Y.

Jan. 14. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. 2 Park Avenue, 26th Floor, New York, N. Y. Speakers: Ralph Walker, of the American Institute of Architects, "The Professional Man"; Dr. Howard I. Cramer, Sharples Chemicals, Inc., "New Chemicals by Sharples".

Jan. 25. Pennsylvania Chapter. Temple University, Philadelphia, Pa.

Jan. 28. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Feb. 14. N. Y. Chapter, American Society of Metals. Speaker, C.

E. Waring. "Fine Metal Finishes and Their Protection During Manufacture, Shipment and Storage." 2 Park Avenue, New York, N. Y.

Feb. 24. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Feb. 29. Pennsylvania Chapter Temple University, Philadelphia, Penna. Speaker: Dr. Ivor Griffith, president Philadelphia College of Pharmacy and Science. "Research in Pharmacy."

Mar. 13. N. Y. Chapter, American Society for Metals. Speaker, C. G. Stephens, "The Inspection and Identification of Engineering Materials." 2 Park Avenue, New York, N. Y.

Mar. 17. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. 2 Park Avenue, 26th Floor, New York, N. Y. Speakers: Harold A. Swanson, National Oil Products Company, "Patents and the Chemist"; Ralph Ericcson, Commercial Solvents Corporation, "The Nitroparaffins".

Mar. 23. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Mar. 28. Pennsylvania Chapter. Temple University, Philadelphia, Penna. Speaker: Dr. Gilbert E. Seil, F.A.I.C., and others: Symposium on Combustion.

Apr. 10. N. Y. Chapter, American Society for Metals. Speaker, J. C. Mathes, "Magnesium". 2 Park Avenue, New York, N. Y.

Apr. 12-16. American Chemical Society. National Meeting.

Apr. 14. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Student Medal presentation. 2 Park Ave. 26th Floor. Speaker: R. M. Baker, Westinghouse Electric and Mfr. Co., "Electronics and Its Application to Research and Development."

Apr. 27. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

May 8. N. Y. Chapter, American Society for Metals. Speaker, A. A. Schwartz, "Induction Heating". 2 Park Avenue, New York, N. Y.

May 12. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Annual Business Meeting. 2 Park Avenue, 26th Floor, New York, N. Y. Speakers: W. S. Thornbill, Shell Development Company, "New Chemicals by Shell"; T. J. Thompson, Corning Glass Works, "Wartime Developments in Industrial Glass."

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May 25. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

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Front, Jacqueline S.
(1943), *Assistant Fellow,* Mellon Institute, Pittsburgh, Penna.

Gelman, George
(1943), *Research Chemist,* Quartermaster Corps (Captain), QMC Subsistence Research Laboratory, 1819 Pershing Road, Chicago, Illinois.

Grim, John M.
(1943), *Research Chemist,* Mellon Institute, Pittsburgh, Penna.

Oswald, Richard K.
(1943),*Chemist,* Lowe Brothers, E. Third Street, Dayton, Ohio.

Tubis, Manuel
(1943), *Assistant Chemist,* U. S. Food and Drug Administration, Custom House, Philadelphia, Penna.

ASSOCIATES

Kahn, Gloria C.
(A.1943), Women's Army Corps, Fort Des Moines, Iowa.

Stern, Edward
(A.1943), *Medical Laboratory Technician,* U. S. Army Medical Depot, 976 Medical Hospital Ship Platoon, Camp Kilmer, New Jersey.

The membership report was read, showing that we have a total of 1795 members.

The membership brochure of the INSTITUTE was discussed and Mr. McCarthy was asked to prepare a small booklet giving information about the INSTITUTE.

The Kilgore bill was discussed in relation to action taken by other societies.

A meeting of the Jury on Medal Award was requested for the evening of the January Council meeting.

Dr. Snell reported for the Committee on Licensure.

There being no further business, adjournment was taken.

CHAPTERS

Baltimore

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News Reporter to THE CHEMIST, Ralph Lamenzo

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National Oil Products Company
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Council Representative, A. Lloyd Taylor

A meeting was held on November nineteenth at 2 Park Avenue, New York, N. Y. with an attendance of over one hundred and fifty members and guests, Dr. M. L. Hamlin presided.

Dr. Charles G. King, scientific director of The Nutrition Foundation, spoke on "The Chemist's Place in Postwar Nutrition". Harry B. McClure, manager of the Fine Chemicals Division of Carbide and Carbon Chemicals Corporation, discussed the "Newer Products of the Aliphatic Chemical Industry", and showed samples of these products. These papers are given elsewhere in this issue of THE CHEMIST.

Miami Valley

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Secretary-treasurer, John R. Fisher, Jr.

Chemical Development Corporation
314 W. 1st Street, Dayton 2, Ohio

Council Representative, Harvey G. Kittredge

A meeting of the Miami Valley Chapter was held in Dayton, Ohio, on November sixth, at which Dr. Gustav Egloff welcomed the new chapter into THE AMERICAN INSTITUTE OF CHEMISTS, and presented it with a charter. He then spoke of the accomplishments and plans for the future of the INSTITUTE.

Niagara

Chairman, Maurice C. Taylor *Vice-chairman,* Lawrence H. Flett

Secretary-treasurer, M. R. Bhagwat

1104 Ferry Avenue
Niagara Falls, New York

Council Representative, Arthur W. Burwell

Alternate, Lothar A. Sontag

Reporter to The Chemist, Frederick Koethen

Pennsylvania

Chairman, Clinton W. MacMullen *Vice-chairman,* Glenn E. Ullyot

Secretary-treasurer, Kenneth E. Shull

23 Bala Avenue
Bala Cynwyd, Pennsylvania

Council Representative, John M. McIlvain

The Pennsylvania Chapter held the first meeting of the current season on October 26th at Mitten Hall, Temple University.

Following an informal dinner and short business meeting the vice chairman, Dr. Glenn Ullyot, introduced Mr. Charles L. Gabriel, vice president of the Publicker Alcohol Corporation. Mr. Gabriel spoke on "Oxygenated Solvents; their Growth and Uses in Synthesis."

Prior to 1920 there were oxygenated solvents available commercially. Those in use were methane and acetone, obtained by the dry distillation of wood; and ethyl alcohol, produced by the yeast fermentation of sugars. Ethyl alcohol was perhaps the first organic solvent known, there being record of its use in ancient times.

During the early nineteen twenties the development of solvents was rapid. Butyl alcohol was produced by the bacterial fermentation of cornstarch. Later it was made synthetically from acetaldehyde. Methanol was made synthetically by hydrogenating carbon monoxide. The various glycols were prepared from the corresponding olefins.

These solvents, and others, may be considered to be the raw materials for the manufacture of a large number of industrial products:

1. From ethyl alcohol:

a. Acetic acid used as a solvent; in dyeing of textiles; in tanning; as cellulose acetate in the manufacture of photographic film and rayon.

b. Acetaldehyde, used in the synthesis of butyl alcohol.

c. Butadiene, used in the manu-

facture of synthetic rubber.

d. Styrene, used in the manufacture of synthetic rubber.

2. From methyl alcohol:

a. Formaldehyde, used in the manufacture of plastics; in the manufacture of anti-freeze; in tanning.

3. From Butyl alcohol:

a. Esters of butyl alcohol, suitable as solvents for lacquers.

A discussion followed Mr. Gabriel's interesting talk.

Washington

President, L. F. Rader, Jr.

Vice-president, L. R. Heiss

Treasurer, T. H. Tremearne

Secretary, Ernest J. Umberger
207 Albany Avenue, Takoma Park, Maryland

News Reporter to THE CHEMIST, S. W. Griffin

Council Representative, T. H. Tremearne

A meeting was held at the Wardman Park Hotel, Washington, D. C., on November fifteenth.

A motion picture entitled "Potash Production in America", was presented by Mr. J. D. Romaine of the American Potash Institute. The three reels of color pictures showed several of the largest plants in operation at Carlsbad, New Mexico, and the mining methods employed.

The annual election of officers was held and the new officers are indicated above.

The attendance was not large, due to the decentralization from Washington to the various regional research laboratories, military absences, and to the withdrawal of Baltimore members to form their own chapter.

The Washington Chapter extends greetings to the newly formed Chapters and wishes them success in their endeavors.

The next meeting of the Chapter will be held on January 15, 1944.

Vincent Eckstein Married

Vincent Eckstein, M.A.I.C., and Miss Marie Heinzelman of Glendale were married October sixteenth at the Savoy Plaza Hotel, New York, N. Y. Mr. Eckstein is an instructor at Brooklyn Polytechnic Institute, Brooklyn, N. Y.

Applications for Membership

For Fellows

Alexander, Allen L.
Senior Chemist, Naval Research Laboratory, Anacostia Station, Washington, District of Columbia.

Blackberg, Solon N.
Medical Director and Director of Research, Nutrition Research Laboratories, 4210 Peterson Ave., Chicago, Illinois.

Dobbs, Carey C.
Industrial Specialist, U. S. Government, Washington, D. C.

Kranz, Frederick H.
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Lidfeldt, Viola
Research Chemist, Pond's Extract Company, Clinton. Conn.

Long, James S.
Chemical Director, Devoe and Raynolds Company, Inc., Louisville, Ky.

Ogilvie, James
Research Chemist, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Othmer, Donald F.
Professor of Chemical Engineering, Polytechnic Institute of Brooklyn, Brooklyn, New York.

Payne, Ralph
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Richards, George H.
Group Leader, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Royal, Lester
Senior Research Chemist, Amino Products Company Division, International Minerals and Chemical Corporation, Rossford, Ohio.

Strouse, George C.
Research Chemist, National Aniline Division, Allied Chemical and Dye Corporation, Buffalo, N. Y.

Taylor, Walter A.
Assistant Director of Research, Pond's Extract Company, Clinton, Conn.

Withrow, James R.
Consulting Chemical Engineer, Professor and Chairman of Chemical Engineering, Ohio State University, Columbus 10, Ohio.

For Member

Affens, Wilbur A.
Chemist, War Department, U. S. Engineer Corps, Ohio River Division, Cincinnati Testing Laboratory, Mariemont, Cincinnati, Ohio.

Blackinton, Roswell J.
Development Chemist, Western States Lacquer Company, Maywood, Calif.

Dietz, James H.
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets. Philadelphia, Pennsylvania.

Hayes, C. Ellwood, Jr.
Senior Chemist, Charles Lennig and Company, 5000 Richmond St., Philadelphia, Pennsylvania.

La Russo, Violet
Assistant Research Fellow, Mellon Institute, Pittsburgh, Penna.

Morrow, Evan R.
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets, Philadelphia, Pennsylvania.

Russell, Maurice
Chemist, Harshaw Chemical Company, Swanson and Jackson Streets, Philadelphia, Pennsylvania.

Smith, Arthur L.
Research Chemist, Polytechnic Institute of Brooklyn, Brooklyn, N. Y.

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By butadiene polymers resilient;
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—Robert Spencer Barnett, F.A.I.C.

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Meeting Dates

Dec. 6-11. Chemical Industries Exposition. Madison Square Garden, New York, N. Y.

Dec. 9. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Dec. 13. N. Y. Chapter. American Society for Metals. National President Meeting. Speaker Marcus A. Trossman, "Hardenability of Steel and the Effects of Alloys." 2 Park Avenue, (26th Floor), New York, N. Y.

Jan. 10. N. Y. Chapter, American Society for Metals. Speaker, Wendell F. Hess, "The Welding of Aircraft Materials". 2 Park Avenue, New York, N. Y.

Jan. 14. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. 2 Park Avenue, 26th Floor, New York, N. Y. Speakers: Ralph Walker, of the American Institute of Architects, "The Professional Man"; Dr. Howard I. Cramer, Sharples Chemicals, Inc., "New Chemicals by Sharples".

Jan. 25. Pennsylvania Chapter. Temple University, Philadelphia, Pa.

Jan. 28. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Feb. 14. N. Y. Chapter, American Society of Metals. Speaker, C.

E. Waring. "Fine Metal Finishes and Their Protection During Manufacture, Shipment and Storage." 2 Park Avenue, New York, N. Y.

Feb. 24. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Feb. 29. Pennsylvania Chapter Temple University, Philadelphia, Penna. Speaker: Dr. Ivor Griffith, president Philadelphia College of Pharmacy and Science. "Research in Pharmacy."

Mar. 13. N. Y. Chapter, American Society for Metals. Speaker, C. G. Stephens, "The Inspection and Identification of Engineering Materials." 2 Park Avenue, New York, N. Y.

Mar. 17. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. 2 Park Avenue, 26th Floor, New York, N. Y. Speakers: Harold A. Swanson, National Oil Products Company, "Patents and the Chemist"; Ralph Ericcson, Commercial Solvents Corporation, "The Nitroparaffins".

Mar. 23. Baltimore Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Loyola College, Baltimore, Maryland.

Mar. 28. Pennsylvania Chapter. Temple University, Philadelphia, Penna. Speaker: Dr. Gilbert E. Seil, F.A.I.C., and others: Symposium on Combustion.

Apr. 10. N. Y. Chapter, American Society for Metals. Speaker, J. C. Mathes, "Magnesium". 2 Park Avenue, New York, N. Y.

Apr. 12-16. American Chemical Society. National Meeting.

Apr. 14. New York Chapter. THE AMERICAN INSTITUTE OF CHEMISTS. Student Medal presentation. 2 Park Ave. 26th Floor. Speaker: R. M. Baker, Westinghouse Electric and Mfr. Co., "Electronics and Its Application to Research and Development."

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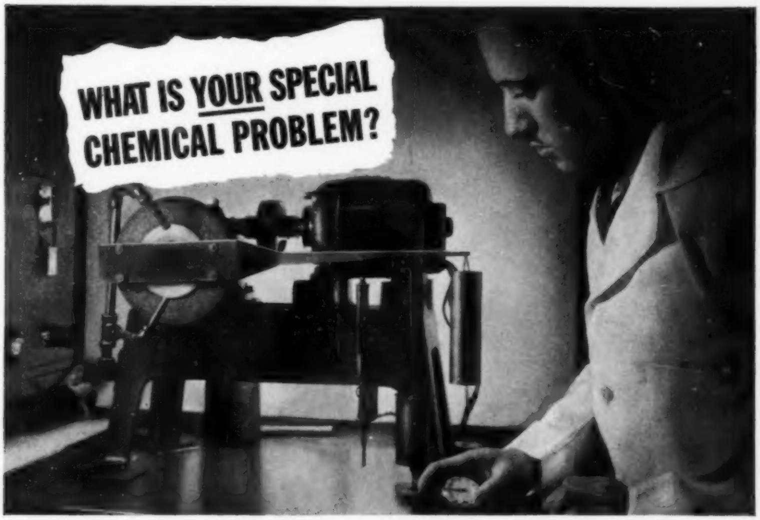

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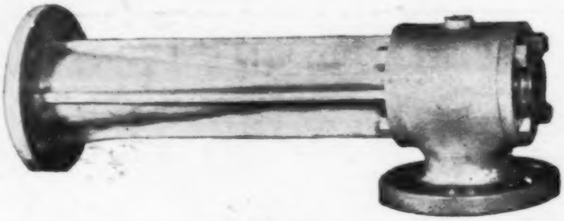

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